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Stewart

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(54) **PROVIDING INFORMATION TO A COMPUTING DEVICE BASED ON KNOWN LOCATION AND USER INFORMATION**

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(58) **Field of Classification Search**

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See application file for complete search history.

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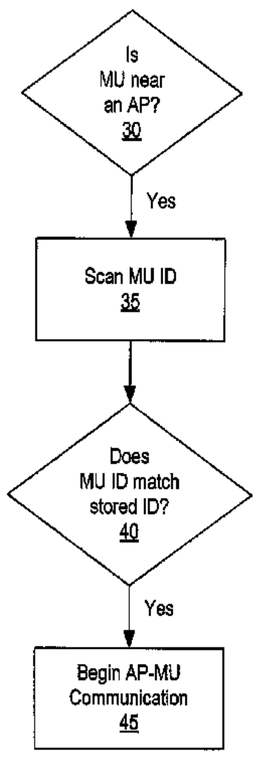
(57) **ABSTRACT**

A method includes receiving a beacon from a mobile device at an access point associated with a transportation station. The beacon includes identification information that identifies the mobile device. The method includes receiving, at the access point via a network, information from at least one service provider based on a location of the access point and the identification information. The method also includes sending the information to the mobile device.

20 Claims, 2 Drawing Sheets



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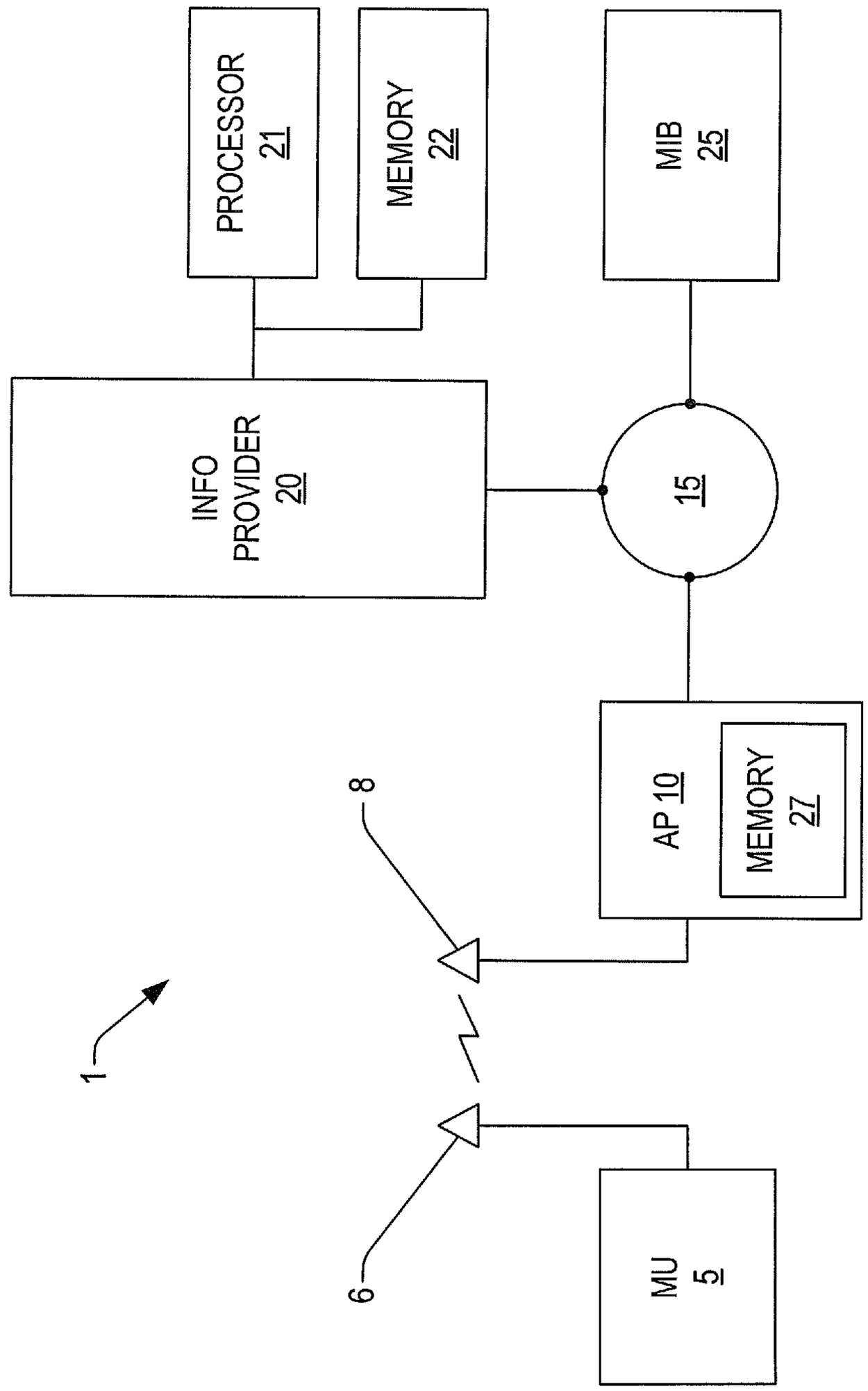
PROCESSOR 21
MEMORY 22
MIB 25
INFO PROVIDER 20
15
AP 10
MEMORY 27
8
1
6
MU 5

FIG. 1

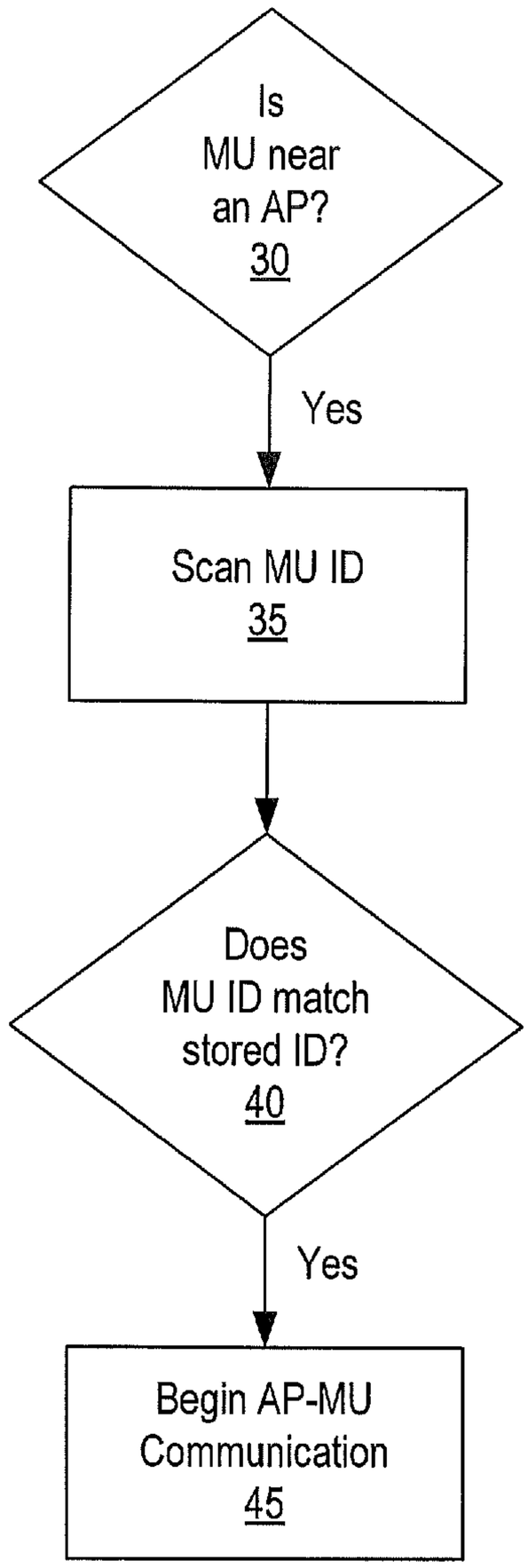
Is
MU near
an AP?
30
Yes
Scan MU ID
35
Does
MU ID match
stored ID?
40
Yes
Begin AP-MU
Communication
45

FIG. 2

PROVIDING INFORMATION TO A COMPUTING DEVICE BASED ON KNOWN LOCATION AND USER INFORMATION

PRIORITY CLAIM

This application is a continuation of, and claims priority to, U.S. patent application Ser. No. 10/776,293, filed on Feb. 11, 2004, which is a continuation of U.S. patent application Ser. No. 09/755,649, filed on Jan. 5, 2001, now issued as U.S. Pat. No. 6,697,018, which is a divisional of U.S. patent application Ser. No. 09/382,551, filed on Aug. 25, 1999, now issued as U.S. Pat. No. 6,326,918, which is a continuation of U.S. patent application Ser. No. 09/186,131, filed on Nov. 4, 1998, now issued as U.S. Pat. No. 5,969,678, which is a continuation of U.S. patent application Ser. No. 08/470,004, filed on Jun. 6, 1995, now issued as U.S. Pat. No. 5,835,061, each of which is hereby incorporated by reference in its entirety.

FIELD OF THE DISCLOSURE

This disclosure generally relates to a geographic-based communications service and, more particularly, an apparatus and method for using known locations of wireless local area network access points (APs) to service mobile users (MUs) of portable smart devices (e.g., notebooks, personal computers, personal digital assistants (PDAs), etc.) that are in the vicinity of these APs.

BACKGROUND

As technology improvements result in smaller, lighter and more portable computing devices, a wide variety of new applications and users will emerge. Users will not only operate such devices in stand-alone mode, but with portability, users will also require the ability to send and receive information through such devices at any location. The need to communicate will arise in circumstances where hard wired links may not be readily available or practical or when the user of the portable computing device cannot be reached immediately. Moreover, a result of user mobility is that the precise location of the user is often variable or not determined. Conventional communications systems for computing devices are not equipped to handle such communication scenarios.

Commercially available personal computers or other similar devices are generally equipped with industry standard interface ports for driving a peripheral device such as a printer, a plotter, or a modem. While operating in an unknown, remote location not connected to a network, the portable personal computer user may be unaware of messages waiting for him. In addition, conventionally, the user must wait until reaching an office or other place with appropriate equipment to receive such messages and to transmit or print documents or other information prepared by the user on his personal device.

By way of example and not limitation, one type of mobile user is a traveler who passes through airports or similar mass transit centers (e.g., subway stations), uses ground transportation and stays in a hotel. In a typical scenario, the traveler may use a personal computer to perform calculations or prepare documents on a personal computing device during an airplane flight. Simultaneously, associates may leave messages for the traveler on a network. In conventional systems, the traveler's work product, and messages destined for the traveler, are not available until the traveler arrives at a location where a wired connection to the traveler's network is available.

A further example of inefficiencies for the traveler concerns travel arrangements themselves. After arriving at an airport, the traveler proceeds to a car rental desk or to some other transportation location. The traveler typically waits in line while the car rental agency inquires about automobile preference, driver's license, method of payment, type of insurance required, etc. Having experienced some delay, the traveler is now on his way to a business location or hotel. Upon arriving at a hotel check-in/registration desk, the traveler often experiences further delay waiting in line and providing the check-in clerk with routine information such as address, length of stay, type of room desired, method of payment, etc. In addition, the business traveler may need to call back to his office to check for telephone messages, thereby incurring further delays.

While accessing databases for information about the traveler, the traveler's preferences and the traveler's requirements can reduce many delays, a common characteristic is that the pending arrival or presence of the traveler is not known to those who can act in advance. Further, conventional systems cannot generally locate a mobile user of a personal computing device and take advantage of that information to reduce the time required to complete routine activities or to provide the user options that can enhance the user's productivity.

In another example, when a user dials a telephone number to an automatic teller machine (ATM) locator, the user is prompted to key in his area code and exchange prefix. The locator system then identifies one or more ATMs within the user's area. However, the system requires the user to call in and cannot locate the user any more accurately than the telephone exchange area. Thus, the mobile user could be advised of an ATM quite a physical distance from the mobile user's location.

SUMMARY

In view of the above limitations of the related art an object of the disclosure is to provide a system in which a mobile user can be geographically located automatically.

It is another object of the disclosure to provide a system which can automatically locate a user with greater precision than is currently available.

A still further object of the disclosure is to provide a system which integrates personal computing devices to networks such that routine tasks, such as travel routing can be accomplished more efficiently.

A still further object of the disclosure is to provide a system that allows a user to employ a personal computing device more effectively and to utilize otherwise idle time, such as time spent waiting at a car rental desk, a hotel registration desk and the like.

According to the disclosure, mobile users communicate with wireless local area networks within a range of an access point (AP). When a user passes an access point, the access point recognizes the user, and the user's device can then retrieve data (telephone, E-mail messages, etc.) waiting for the user and transmit information (E-mail messages, print documents, requests for information from service providers, etc.) that the user may have for transmission to a desired recipient. For instance, this process could occur as a user exits an airplane and is detected by an access point in an airport.

Accordingly, the present disclosure is directed toward a method and apparatus for using known locations of local area network APs (access points) to service mobile users who are

in the vicinity of these APs. Such access points and mobile units typically communicate with each other in a wireless manner. The method according to the disclosure includes the steps of: (a) detecting the presence of a mobile unit in the vicinity of an access point and (b) transmitting/receiving information from the mobile unit to/from the network through the access point.

According to the disclosure, information and services can be provided by various providers connected to the network which are able to respond to unanticipated requests or which have acquired knowledge about the user's requirements, preferences and habits over a period of time and have extrapolated information from the user's past practices for probable future actions consistent with these past actions.

For example, in one application, an access point receives a print job from a user's mobile unit and sends it to a printer available at a destination point designated by the user so that the document is printed and available to the user upon his arrival at his destination. In another application according to the disclosure, upon detecting the arrival of a user's mobile unit at a destination, a message, for example, an E-mail message, is sent to the user's rental car agency. The agency can take appropriate actions so that the user's rental car is ready and the user does not waste time waiting in line. Using a similar approach, a user can be pre-registered at a hotel so that his room is ready upon arrival.

Thus, according to the disclosure, a geographic-based communications service system for mobile users includes a mobile unit for transmitting and receiving information and a plurality of access points connected to a network and arranged at known locations in a geographic region for transmitting the information to and receiving the information from said mobile unit. One of the access points detects the presence of a mobile unit and sends a signal to the network. A plurality of information providers are connected to the network. The network accesses the information providers based on the signal received from a mobile unit via the access points to provide data to the mobile unit or to another entity on behalf of the user of the mobile unit. In particular, the known location of the access point detecting the presence of the mobile unit defines the location of said mobile unit. Based on the location of the mobile unit as detected by the AP, a service provider on the network can take actions appropriate to the user's location, such as notifying a car rental agency of the user's presence or notifying the user of canceled flights and adjustments to the user's itinerary. Further according to the disclosure, clocks in the user's mobile device and event schedules can be updated automatically to correspond to the present time in the time zone where the access point detecting the user's mobile unit is located.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a representation of a geographic-based communications service system, according to the disclosure; and

FIG. **2** is a flow chart showing a mobile unit interfacing with an access point, according to the system of FIG. **1**.

DETAILED DESCRIPTION

FIG. **1** shows a geographic-based communications service system, generally designated **1**, according to the disclosure. The system includes a mobile unit (e.g., portable computer) **5**, an AP (access point) **10**, an information provider **20**, a management information base (MIB) **25** and a centralized network **15**. The information provider **20** will typically have a processor **21** and memory **22** with controlled access thereto. Typically, access point **10** and mobile unit **5** communicate in a wireless manner. Thus, mobile unit **5** and access point **10** would be equipped with an appropriate transmitter and receiver compatible in power and frequency range to establish such a wireless communication link. In addition, mobile unit **5** would also be equipped with a code generator which generates an identification code that can be transmitted to and recognized by the access point **10** or a system accessed through access point **10**. Such an identification code allows recognition of a user before providing access to system services, thereby providing a measure of security and a service billing mechanism.

FIG. **2** is a flow chart showing an implementation of the communication between the mobile unit **5** and an access point **10**. In step **30**, the access point **10** determines whether the mobile unit **5** is within a range of the access point **10**. In steps **35** and **40**, the access point **10** scans the mobile unit **5** and determines whether a mobile unit identity (ID) matches a stored ID, and in step **45**, the communication between the mobile unit **5** and the access point **10** begins. The communication between mobile unit **5** and access point **10** may include sending and receiving information which may include text, voice data and video data.

As illustrated in FIG. **2** a first step according to the disclosure is establishing a connection between a mobile unit and an access point. Referring again to FIG. **1**, the mobile unit **5** can send a beacon signal that is picked up by one of the APs **10** located in a plurality of locations within a geographic region. When the beacon signal is picked up by a particular AP **10**, the beacon signal is transmitted back to the management information base (MIB) **25** by AP **10**. Since a location of the access point is defined and known by MIB **25**, detection of the presence of the mobile unit by an AP **10** allows MIB **25** to know exactly where the mobile user is located at any given time. For example, the MIB could store the latitude, longitude, altitude, and other geographic information such as a local map of the area of each access point.

The precision available in this type of mapping scheme is distinguished from that typically achieved in a cellular telephone system. In a cellular telephone system a user transmits a beacon signal at a fixed frequency. When the user moves from a first "cell" to a second "cell", the receiver located at the midpoint of the first cell no longer picks up the beacon signal, and the receiver located at the midpoint of the second cell picks up the beacon signal. A cellular telephone "handoff" in which the phone call is now under control of the second cell then takes place. It is only possible to locate the user to a relatively large area defined by the cells. There is no provision for locating the user more precisely within the cell. Thus, a cellular system is limited in its ability to provide services requiring the precise location of the user.

In the present disclosure, it is only necessary to provide the mobile unit a method of determining its own location. It is not necessary to provide tracking of the mobile unit's whereabouts. For example, upon establishing a connection with an AP **10**, the mobile unit **5** can transmit a message inquiring "Where is this AP?" Upon receiving the answer that the AP **10** is located at the user's destination airport, the mobile unit can then transmit an E-mail to a car rental agency or hotel to AP **10**. AP **10** routes the message through a network connected to AP **10** so that the user's car or hotel room is ready upon his arrival. Once the message is provided to the AP, it is not necessary to continue to track the user.

In another approach according to the disclosure, one or more selected APs **10** can be programmed to watch for the arrival of a particular mobile unit (target mobile unit). Upon detecting the presence of the target mobile unit, the AP **10**

establishing the link with the target mobile unit sends a message directly to the rental car agency, hotel, etc. Since the message has been sent, other APs can then be directed to cease watching for the target mobile unit.

Another feature according to the disclosure allows the user to access a service provider over a network connected through the access point. For example, upon establishing its location, a mobile unit can direct an inquiry through the AP over the network connected to the user's bank to locate the nearest ATM. Since the user's location is established with relative precision by the location of the AP, the service provider can respond with a message such as "Straight ahead to exit 3, turn right and proceed two blocks." The message is routed to the user through the same AP.

According to the disclosure, service can be initiated by the mobile unit's transmission of an inquiry requiring a response. Alternatively, service can be initiated by an element of the network, such as a service provider, when an AP **10** detects the presence of a mobile unit. As an element of the network, the AP **10** could access its memory to initiate the service or transmit a message over the network to a service provider who initiates the appropriate service.

A system according to the disclosure would include a plurality of APs and mobile units and could be configured to allow all users access to all service providers on a network or to allow selected users access to selected service providers, depending on a service profile contracted for by the user. For example, according to the disclosure, system software could be programmed to provide service gates in which a user identification code is compared with a list of authorized codes for access to the particular service. In addition, users could contract for unlimited access for a fixed fee or for time billed access or some combination thereof. Service usage records for billing and other purposes can be maintained in an automated database, so that users can be billed by a single entity that maintains the network of APs or individually by each service provider.

Assume, for example, that a user of the mobile unit **5** is located at an airport and that several APs **10** are located at the same airport. The mobile unit **5** is connected to an antenna **6**, and AP **10** is connected to an antenna **8** which can both receive and transmit radio frequency (RF) signals at designated transmit and receive frequency bands. RF signals over-the-air from AP **10** are received by the antenna **6**, and sent to mobile unit **5**.

The mobile unit **5** can send information to the AP **10**, for example, in order to retrieve messages or obtain information needed by the user or to send messages and data to other users. These messages are entered by the user through the mobile unit **5** or can be automatically generated, as in the previously described case of sending a message to a car rental company signaling the user's arrival at the airport. During this process, antenna **6** transmits the RF signal which is received by antenna **8** and sent to AP **10**.

In one embodiment, when a beacon signal output from the mobile unit **5** is detected and received by AP **10**, information in the beacon signal identifying the mobile unit is transmitted back to network **15**. The information sent back to network **15** includes the identification number of the mobile unit **5** and AP **10**, thereby identifying both the user and his location to the network. Using this identification and location data, network **15** provides desired services (or arranges to provide desired services by accessing appropriate providers) and essential information to the user of the mobile unit **5**. Based on the type of information required, network **15** may access one or more information providers **20** to provide the information or services to the user. One or more information providers **20** are coupled to network **15** in a ring-network configuration, a star-network configuration, or other type of connection known in the art.

Other query/response approaches to link the mobile unit **5** and AP **10** could also be employed within the scope of the disclosure. For example, AP **10** could scan its coverage area, thereby causing a mobile unit **5** in the area to generate a response using active or passive circuitry. Such a response could be either a simple presence indication causing the AP **10** to transmit a further inquiry message requesting the mobile unit's identification information. Alternatively, in response to an AP scan, the mobile **5** could transmit its identification data immediately. Since a mobile unit may be in an area serviced by an AP for some time, either the AP or the mobile unit could be configured to determine if any correspondence is necessary before engaging in further communication.

In a simplified configuration according to the disclosure, the mobile unit could be configured merely as a device to locate its user through the APs **10**. In this case, a processor on the network **15** would then take the appropriate action, such as sending an E-mail to the user's car rental agency, upon detection of the user's presence by an AP.

Network **15** shown in FIG. **1** stores information in the MIB **25**. MIB **25** is a mechanism, such as a memory, which allows the persistent storage of information needed by network **15** to operate. Examples of such information include a directory of all the elements (APs, mobile units, etc.) in the network, the topology of the network, characteristics of individual network elements, characteristics of connection links, performance and trend statistics, and any information which is of interest in the operation of the network **15**. For example, the MIB would store the precise longitude, latitude, altitude and other geographic information pinpointing the location of each AP **10**. Alternatively, an access point can be located by its proximity to another known location. For example, an access point location may be defined as a particular hotel known to be a particular address or having known latitude and longitude coordinates. The extent of geographic area covered by an access point may be defined in the same ways.

In order to reduce message traffic over the network, all or part of MIB may be stored at one or more access points **10**. In particular, static information which does not change, or changes relatively infrequently, can be stored in the AP **10**. Thus, as shown in FIG. **1**, AP **10** includes a memory **27** for storing at least a portion of the MIB. For example, memory **27** could store the location of the AP **10**, the local map, local services and other information, such that routine requests for information from the mobile unit, such as "Where am I" requests need not be serviced over the network, leaving more resources for other message traffic.

By way of example and not limitation, service and information providers **20** may include car rental agencies, hotels, restaurants, airline reservation centers, banks, taxi services, bus and train reservation offices, printing services, on-line database services, message services, and E-mail providers, so that the user can receive messages. The system according to the disclosure may also provide the user access to updates on specific databases, such as a database maintained by the user's employer (e.g., a company rolodex) or the user's own personal databases and any other service which can be used in a remote manner.

Any of the service and information providers **20** may maintain in memory data files on members and subscribing merchants and have the ability to extract data from past transactions for each of the users to facilitate future plans. In this way, the service providers have available the information to learn

the past habits and preferences of their subscribers and provide corresponding services for new transactions.

For example, upon learning that a business traveler is scheduling a trip to Austin, service and information providers **20** consider the previous trips by the traveler develop a suggested itinerary, and book travel, hotel, car and restaurant reservations. The information providers **20** acquire knowledge about the habits of the traveler over a period of time, store the information in a memory, and extrapolate information from past habits for probable future actions consistent with these past actions. For example, when arranging for a rental car, the information stored in the service provider's memory for a particular subscriber may indicate that the subscriber typically requests a four door intermediate size car. Referencing this information, the service provider would now reserve a similar vehicle, unless otherwise instructed by the mobile unit.

A system according to the disclosure also has processing and memory access to operate in an interactive or adaptable mode. For example, when the user of the mobile unit **5** arrives at the airport, his identity, as well as the fact that he is at the airport, is detected by AP **10** and transmitted to the network, for example using the beacon signal emitted from his mobile unit **5**, as previously described. One or more service providers with access to transportation schedules, flight status information, hotel or automobile rental information, weather information, ground maps or other information desired by the user employs network **15** to send the user updated information about whether a connecting flight has been delayed, alternative routings, where to go to pick up a pre-specified rental car, directions to a preferred hotel and other types of information.

Since the location of the AP **10** communication with a mobile unit **5** is known precisely, service and information provider **20** can employ processors to provide only suitable information to the user and can track the user's last reported location. For example, since updated information can be sent to the mobile unit **5**, based on the location of the mobile unit **5**, information that is pertinent only to the fact that the user of the mobile unit **5** is at the airport need be sent back to the mobile unit **5** via the communication path between AP **10** and the mobile unit **5**. Other information can be sent at other times.

For purposes of illustration, FIG. **1** shows one AP **10** and one service and information provider **20** connected to network **15**. However, any number of such APs and service and information providers would typically be connected to network **15** to service any number of mobile units, the only limitations being physical ones, such as constraints on bandwidth.

In a variation of a system according to the disclosure, the mobile unit **5** initiates a request for information from the network **15**. For example, the user of the mobile unit **5** finds the location of the nearest automatic teller machine (ATM) by entering the request into the mobile unit **5**, which will be received by the nearest AP **10**. AP **10** forwards this request for information to the network **15**. Network **15** routes the request to a service and information provider who obtains the requested information transmits it back to mobile unit **5** through AP **10**.

In another variation of a system according to the disclosure, network **15** is connected to other types of communications networks, such as a public switched telephone network (PSTN), whereby the user of the mobile unit **5** sends and receives information from/to the PSTN or other communication network through a service provider. The service provider would employ processors and other apparatus to convert protocols and data formats from those used on the network **15** to those compatible with the PSTN or other communication network. For example, the user may receive facsimile information from a PSTN connected to the network **15**.

Another feature according to the disclosure is the ability to adjust time clocks in the mobile unit to display and generate schedules using the correct time in the time zone where the user is located. This feature could be accomplished by sharing in the MIB a time zone identifying code for each access point and during communication between an access point and a mobile unit, notifying the mobile unit of the correct zone. Alternatively, the time zone information could be stored in the access point or the access point could be instructed to check with a time reference (e.g., Greenwich Mean Time) and calculate local time. Alternatively, the time zone could be determined for the longitude of the access point stored in the MIB. This determination could be made either by the information provider and transmitted as a time zone message to the mobile unit or could be determined in the mobile unit using the longitude information of the access point.

Still another feature according to the disclosure is the ability to provide customized messages based on the location of the active access point or based on the user's profile. For example, a user accessing a network through an access point in a hotel may be provided information about promotions offered by that hotel or other affiliated hotels, airlines, car rental agencies or other providers of goods and services.

The apparatus and method according to the disclosure and many of its attendant advantages will be understood from the foregoing description and it will be apparent that various changes may be made in form, construction and arrangement of the parts thereof without departing from the spirit and scope of the disclosure or sacrificing all of its material advantages, the form described here being merely a preferred embodiment thereof.

What is claimed is:

1. A method comprising:

receiving a beacon from a mobile device at an access point associated with a transportation station, wherein the beacon includes identification information that identifies the mobile device;

determining, at the access point, that a service provider associated with the mobile device is identified in a list of service providers that are to be sent messages upon detection of the mobile device by the access point;

sending a presence message from the access point to equipment of the service provider; and

sending a cease monitoring message to another access point associated with the transportation station to inhibit a second access point associated with the transportation station from sending another presence message when the second access point detects the mobile device.

2. The method of claim **1**, wherein the transportation station is an airport.

3. The method of claim **2**, further comprising:

receiving, at the access point via a network, information from the equipment of the service provider based on the presence message, wherein the information comprises connecting flight information; and

sending the information from the access point to the mobile device.

4. The method of claim **1**, wherein the transportation station is a subway.

5. The method of claim **1**, further comprising:

receiving, at the access point via a network, information from the equipment of the service provider based on the presence message, wherein the information comprises directions to a hotel based; and

sending the information from the access point to the mobile device.

6. The method of claim **1**, further comprising:

receiving, at the access point via a network, information from the equipment of the service provider based on the presence message, wherein the information comprises directions to a transportation service location; and

sending the information from the access point to the mobile device.

7. The method of claim **6**, wherein the transportation service location comprises a car rental service.

8. The method of claim **6**, wherein the transportation service comprises a taxi service.

9. The method of claim **1**, further comprising:

receiving a query at the access point from the mobile device;

determining whether information answering the query is in a memory of the access point; and

sending an answer to the query to the mobile device from the memory of the access point when the answer to the query is in the memory of the access point without contacting an information provider for the answer via a network.

10. The method of claim **9**, further comprising:

sending the query to the information provider via the network when an answer to the query is not in the memory of the access point;

receiving the answer to the query from the information provider via the network; and

sending the answer to the mobile device from the access point.

11. A method comprising:

receiving a beacon from a mobile device at an access point associated with a transportation station, wherein the beacon includes identification information that identifies the mobile device;

determining, at the access point, that a service provider associated with the mobile device is identified in a list of service providers that are to be sent messages upon detection of the mobile device by the access point;

sending, via the access point, a presence message to equipment of the service provider; and

sending, via the access point, a cease monitoring message to access points associated with the transportation station to inhibit a second access point of the access points from sending another presence message when the second access point detects the mobile device.

12. The method of claim **11**, wherein the access point forwards information associated with a car rental agency to the mobile device based on the presence message, the information received by the access point from the equipment.

13. The method of claim **11**, wherein the access point forwards information associated with a hotel to the mobile device based on the presence message, the information received by the access point from the equipment.

14. The method of claim **11**, wherein the transportation station is an airport.

15. The method of claim **11**, wherein the transportation station is a subway station.

16. The method of claim **11**, wherein the list is stored in a memory of the access point.

17. A system comprising:

a processor of an access point associated with a transportation station;

a memory coupled to the processor, wherein the memory includes program instructions which are executable by the processor to perform operations comprising:

receiving a beacon from a mobile device at the access point associated with the transportation station, wherein the beacon includes identification information that identifies the mobile device;

determining, at the access point, that a service provider associated with the mobile device is identified in a list of service providers that are to be sent messages upon detection of the mobile device by the access point;

sending, via the access point, a presence message to equipment of the service provider; and

sending, via the access point, a cease monitoring message to another access point associated with the transportation station to inhibit a second access point associated with the transport station from sending another presence message when the second access point detects the mobile device.

18. The system of claim **17**, wherein the service provider comprises an electronic mail service provider.

19. The system of claim **17**, wherein the mobile device comprises a computer.

20. The system of claim **17**, wherein the operations include sending weather information to the mobile device, wherein the weather information is associated with a location of the access point.

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